Module 7

Soil Protection and BMP Installation

Module 7a

Introduction, Protecting your soils

For site designers (and Reviewers)!

For site designers!

Design your site with stormwater in mind, <u>do not</u> consider stormwater management an afterthought.

Some Common Principles of Environmental Site Design that Involve Protecting Soils

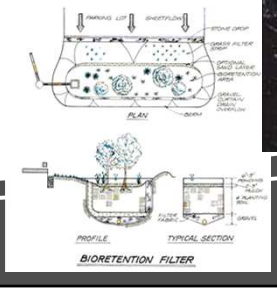
1. Reduce Residential Road Width
2. Reduce Residential Street Length
3. Reduce Residential Right-of-Way Width
4. Minimize Cul-du-Sacs

Some Common Principles of Environmental Site Design that Involve Protecting Soils

5. **Use Vegetated Open Channels in Place of Curb and Gutter**
6. Optimize Parking Ratios
7. Plan for Public transportation
8. **Reduce Parking lot Imperviousness**

Some Common Principles of Environmental Site Design that Involve Protecting Soils

9. Use Parking Decks and Parking Garages (Structured Parking)
10. **Provide Stormwater Treatment on Parking Lots**
11. Cluster Development
12. Relax Frontage and Setback Distance Requirements



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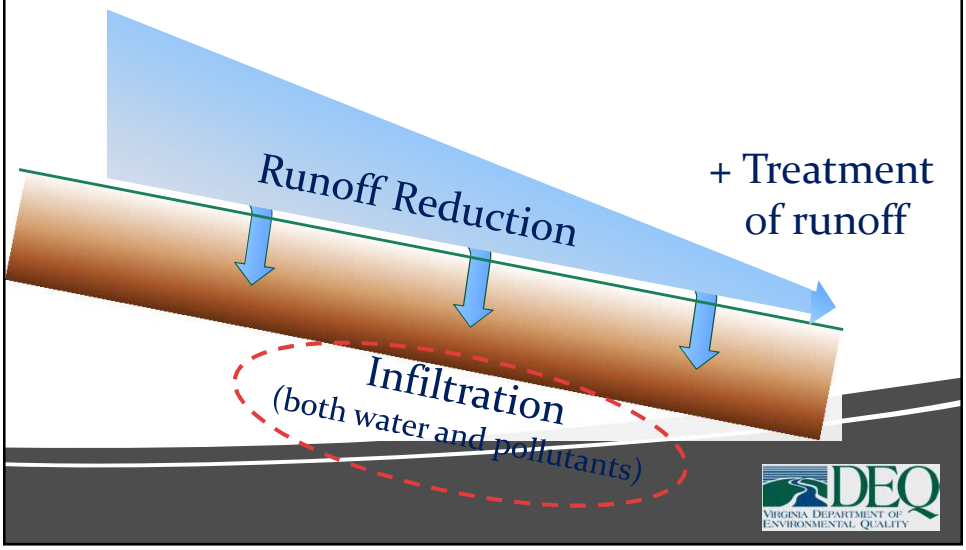
Some Common Principles of Environmental Site Design that Involve Protecting Soils

13. Apply More Flexible Sidewalk Standards
14. Alternatives or Shared Driveways
15. **Manage your Open Space**
16. **Direct Rooftop to Impervious Areas**

Some Common Principles of Environmental Site Design that Involve Protecting Soils

17. Provide Stream Buffers
18. Maintain Buffers (RPA?)
19. Minimize Clearing of Native Vegetation

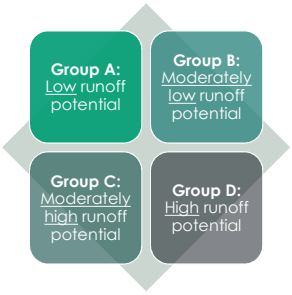
(New) Stormwater Paradigm



#1 Soil Principle

When utilizing RR, preserve the infiltration capacity of the soil as much as possible!

How?



Maintaining:
- Structure
- Bulk Density
- Organic Matter

Especially when you have soils in the Hydrologic Soil Groups A and B on which you will be placing the BMPs!

How do I Maintain?

1. Structure & Bulk Density?

A: Minimize disturbance and compaction of the soil in areas that will be used for infiltration practices

2. Organic Matter?

A: Keep areas that will be used for infiltration vegetated as long as possible

If you can't?

- Improve the soil through:
  - Tillage
  - Compost amendments

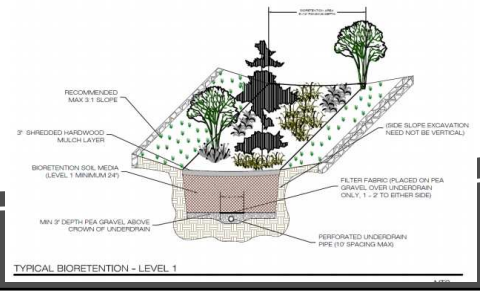
Sheet flow
Grass channels
Extended Detention

If you can't, or when you have C and D soils?

Most of the other BMPs require an engineered soil medium with a good infiltrating subsoil (which can also be damaged during construction)

or …

Underdrain ➔ Treatment 1 (≈loss of efficiency)



Module 7b

BMP Installation

Summary Table of the Draft 2013 BMP Stormwater BMPs

BMP Group	Specific BMP	Soils [1]	Water Table Separation	Depth to Bedrock/ Shallow Soils	Contrib. Drainage Area (Ac.)	Max. Site Slope[2]	Hydraulic Head (Ft.)	Karst Geology or a Sinkhole	Cold Climate (cf Table 8.5)
					Maximum				Frozen

BMP Group

- Runoff Volume Reduction
- Swales and Open Channels
- Filtering Systems
- Infiltration Practices
- Basins
- Manufactured Treatment devices

Summary Table of the Draft 2013 BMP Stormwater BMPs

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					Maximum				Frozen

Specific BMPs
- Engineering recommendation
- Runoff Reduction Spreadsheet

Soils
- A
- B
- C
- D
- Soil survey
- Geotechnical report

Water Table Separation
- Water table indicators
- Geotechnical report
- Soil survey

Depth to bedrock
- Geotechnical report
- Soil survey

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Summary Table of the Draft 2013 BMP Stormwater BMPs

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					Maximum				Frozen

Contributing Drainage Area
- Site Survey
- GIS

Maximum Site Slope
- Engineering design

Hydraulic Head
- Site Survey
- Engineering calculations

Karst Geology or Sinkhole
- Geographic location
- Local knowledge
- Geotechnical report

Cold Climate
- Geographic location
- Local knowledge

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Runoff Volume Reduction BMPs

1. Rooftop Disconnection

Soils:

- HSG A & B 50%
- HSG C & D 25%

But:

Alternate Practice	Specification No.	Runoff Reduction Rate
Soil compost-amended filter path	4	50%[2]
Dry well or french drain #1 (Micro-infiltration #1)	8	50%
Dry well or french drain #2 (Micro-infiltration #2)	8	90%
Rain garden #1, front yard bioretention (Micro-bioretention #1)	9	40%
Rain garden #2, front yard bioretention (Micro-bioretention #2)	9	80%
Rainwater harvesting	6	Defined by user
Stormwater Planter (Urban Bioretention)	9 (Appendix A)	40%

[1] CWP and CSN (2008), CWP (2007)
[2] Compost amendments are not credited with additional volume reduction an HSG A & B soils. Primary use is to improve the volume reduction performance of disconnection in C & D soils.

1. Rooftop Disconnection

- 2 feet separation from water table
- 2 feet separation from bedrock
- Preferred BMP for karst and sinkhole situations

2. Sheet flow

Soil:

- No fill
- Compost amendment with C & D soils

- 2 feet separation from water table
- 2 feet separation from bedrock
- Preferred BMP for karst and sinkhole situations

4. Compost Amendments

Soils:

- HSG B though D

- 1.5 feet separation from water table
- 1.5 feet separation from bedrock
- Allowed BMP for karst and sinkhole situations

Infiltration Practices & Basins

Infiltration practices may rely on manufactured soils or amended soil

But!

We need to know what the underlying conditions are: A,B,C, or D soils, water table, bedrock, karst etc.

Basins on A&B soils may require liners!

Module 7c

Inspection

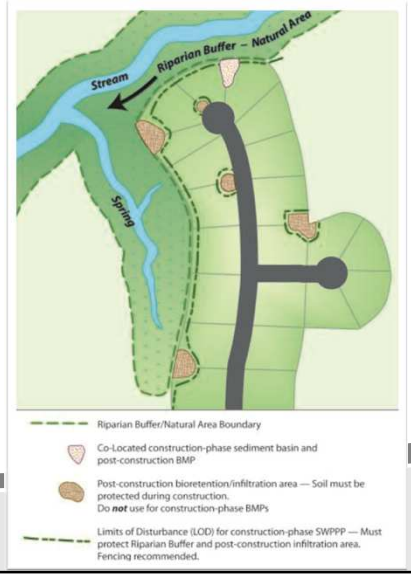
Inspections

- During construction
  - ESC
  - P2
  - BMP Installation
- Post construction
  - Maintenance

Common Issues in BMP Installation

1. Co-location of ESC and SW practices
2. Construction sequence
3. Materials

1. Co-Located Practices?



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1. Co-Located Practices?

Co-Located

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1. Co-Located Practices?

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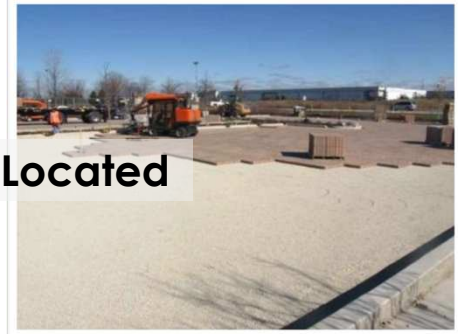
1. Co-Located Practices?

NOT Co-Located



Infiltration

Permeable pavement

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2. Construction Sequence

Permeable pavement

Grass channel

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2. Construction Sequence

Stabilize drainage area
Block inlets and/or divert water if necessary

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2. Construction Sequence

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3. Materials

Some reasons Why BMPs fail

- Water logged?
- Restrictions?
- Toxicity?
- Underdrain plugged?

How do we test this?

- Soil samples

Some reasons Why BMPs fail

But the most important questions of all:

1. What is the hydrology of the design and is the site actually draining to the BMP?
2. Does the BMP actually receive the runoff that it was promised?

After Completion and for Maintenance

- BMPs require a maintenance agreement
- Need a regular maintenance and inspection cycle.


LOONEY TUNES
"That's all Folks!"